Four Mile Run Bacteria TMDL Implementation Plan

1st Public Meeting
June 11, 2003

PRESENTING ORGANIZATIONS:

City of Alexandria

Arlington County

City of Falls Church

Fairfax County

Virginia Dept. of Environmental Quality

Virginia Dept. of Conservation and Recreation

Northern Virginia Regional Commission

Agenda

- Introductions, Master of Ceremony & Host Agency
  - Arlington County
- Background
  - Virginia Department of Environmental Quality
- Current Pollution Control Activities
  - City of Falls Church
  - Fairfax County
  - City of Alexandria
  - Arlington County
- TMDL Results & Implementation Plan Development
  - Northern Virginia Regional Commission
- Potential Funding Sources
  - Virginia Department of Environmental Quality

Developing an Implementation Plan for the Four Mile Run Bacteria TMDL

First Public Meeting

June 11, 2003

Presentation Overview

1. Overview of Virginia's TMDL Program
2. Applicable Water Quality Standard
3. Four Mile Run Impairment

What is a TMDL ?

- TMDL stands for **Total Maximum Daily Load**
- A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet **water quality standards**
- A TMDL includes an **allocation** of that maximum amount to the pollutant's sources
- A TMDL is a **pollution budget**

TMDL Equation

A TMDL is summarized as:

TMDL = Sum of WLA + Sum of LA + MOS

Where:

- TMDL = Total Maximum Daily Load
- WLA = Waste Load Allocation (point sources)
- LA = Load Allocation (nonpoint sources)
- MOS = Margin of Safety

When are TMDLs needed?

- State and federal law require TMDLs to be developed for **impaired** waters
- Impaired waters do not meet applicable **water quality standards** (WQS)
- Waters that do not meet WQS do not support their **designated use(s)**
- For bacteria impairments, the designated use that is affected is the **recreational use**

Regulatory Basis of TMDLs

- TMDLs required by Federal and State law
  - 1972 Clean Water Act (CWA), Section 303(d)
  - 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA)
- 1998 lawsuit filed by the American Canoe Association and the American Littoral Society against EPA for failure to comply with CWA §303(d) in Virginia
- 1999 Consent Decree requiring EPA and Virginia to complete 636 TMDLs by 2010

Regulatory Requirements

- Both state and federal law require:
  - Establishment of water quality standards
  - Monitoring of water quality in surface waters
  - Assessment of water quality in surface waters
  - Listing of waters that do not meet water quality standards (impaired waters)
  - Development of TMDLs for impaired waters
- State law requires, and federal law recommends:
  - Development of a TMDL Implementation Plan

TMDL Implementation

- After the TMDL is approved by EPA, an Implementation Plan (IP) is developed
- State and/or local agencies can lead IP development
- The IP will include staged reduction targets
  - Allows the most cost-effective measures to be implemented first
  - Allows the iterative evaluation of TMDL adequacy in achieving the water quality goals
  - The last stage may require the review of and/or changes to the Water Quality Standard

Components of a TMDL IP

The TMDL IP will include the following:

1. Executive summary
2. Introduction
3. Summary of State and Federal IP requirements
4. Review of TMDL results
5. Description of public participation in IP development

Components of a TMDL IP (continued)

6. List of implementation actions and associated costs, benefits and environmental impact of addressing the impairment*
7. Measurable goals and milestones and the date of expected achievement of water quality objectives*
8. Stakeholders' roles and responsibilities
9. Integration with other watershed planning efforts
10. Potential funding sources

(Required under WQMIRA)*

Roles of DEQ and DCR in TMDL and IP Development

- DEQ is the lead for TMDL development, including submittal to EPA
- DCR is the lead for most TMDL Implementation Plan (IP) development
  - DEQ is the lead agency in the development of the Four Mile Run IP
- DEQ is responsible for ensuring public participation in TMDL program

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Water Quality Standards

- Water Quality Standards (WQS):
  - set by states and approved by EPA
  - set **numeric** and **narrative** limits on pollutants
  - consist of **designated use(s)** and water quality **criteria**
- Purpose of WQS:
  - **protection** of 5 designated uses (aquatic life, fish consumption, shellfish, recreation, drinking water)
  - **restoration** of state waters to meet criteria

Applicable Designated Use

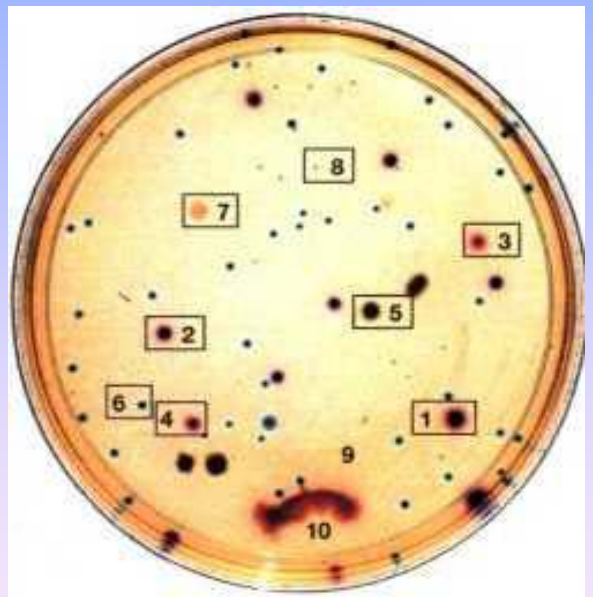
- All surface waters in Virginia are currently designated for **primary contact recreation** (e.g. swimming)
- In March 2003, a **secondary contact recreation** use designation (e.g. wading, fishing) was added to the WQS
  - Five times the primary contact criteria
  - Individual waters will only be considered for reclassification after TMDL implementation has been tried using reasonable BMPs
  - Effective date pending EPA approval

Pollutant of Concern

- ***Fecal bacteria*** are found in the digestive tract of humans and warm blooded animals
- Fecal bacteria are an indicator of the potential **presence of pathogens** in waterbodies
- The presence of fecal bacteria in water samples is a strong indicator of recent **sewage or animal waste contamination**

Sampling for Bacteria

- Stream samples are collected in sterile 125 mL sample bottles
- Samples are filtered to deposit bacteria on filters
- Filters are incubated, allowing individual bacteria to grow into visible colonies
- Colonies are counted to give a concentration of colony forming units (cfu) per 100 mL



Old Criteria

- Indicator species: **fecal coliform**
  - used in Four Mile Run listing and TMDL development

- **Instantaneous max**: **1,000 cfu/100 mL**
- Applicable for data sets with 1 or fewer samples in 30 days
- Used in **water quality assessment** because monitoring is usually conducted bimonthly

- **Geometric mean: 200 cfu/100 mL**
- Applicable for data sets with 2 or more samples in 30 days
- Used in **TMDL development** because model output is usually daily

New Criteria

- Indicator species for freshwater: ***E. coli***
  - change in indicator species from fecal coliform to ***E. coli*** (fresh water)
  - *E. coli* bacteria are a **subset of fecal coliform** bacteria and correlate better with swimming-associated illness

- **Instantaneous max**: **235 cfu/100 mL**
- Applicable for all data sets; no samples may exceed the maximum

- **Geometric mean: 126 cfu/100 mL**
- Applicable for data sets with 2 or more samples in a calendar month

Interim Criteria

- Indicator species: **fecal coliform**
  - will be phased out when 12 *E. coli* observations available or after June 30, 2008, whichever comes first
  - will not be used to assess compliance

- **Instantaneous max**: **400 cfu/100 mL**
- Applicable for all data sets; no more than 10% of samples in a calendar month may exceed the maximum

- **Geometric mean: 200 cfu/100 mL**
- Applicable for data sets with 2 or more samples in a calendar month

Summary of Changes in Primary Contact Criteria

Indicator	Status	Instantaneous Maximum (cfu/100mL)	Geometric Mean (cfu/100 mL)
Fecal Coliform	Old	1,000	200
E. coli	New	235	126
Fecal Coliform	Interim	400	200

- Changes went into effect on January 15, 2003
- Both New *E. coli* and Interim Fecal Coliform criteria apply
- Fecal coliform criteria will be phased out entirely once 12 *E. coli* samples have been collected or after June 30, 2008

Comparison of the Old Fecal Coliform and New *E. coli* Criteria

Old FC (cfu/100mL)	Interim FC (cfu/100mL)	FC translated to EC* (cfu/100mL)	New EC (cfu/100mL)
200	200	129	126
	400	243	235
1,000		565	

*Based on regression model between 493 dual data points

Note: FC = Fecal Coliform, EC = *Escherichia Coli*

Presentation Overview

1. Overview of Virginia's TMDL Program
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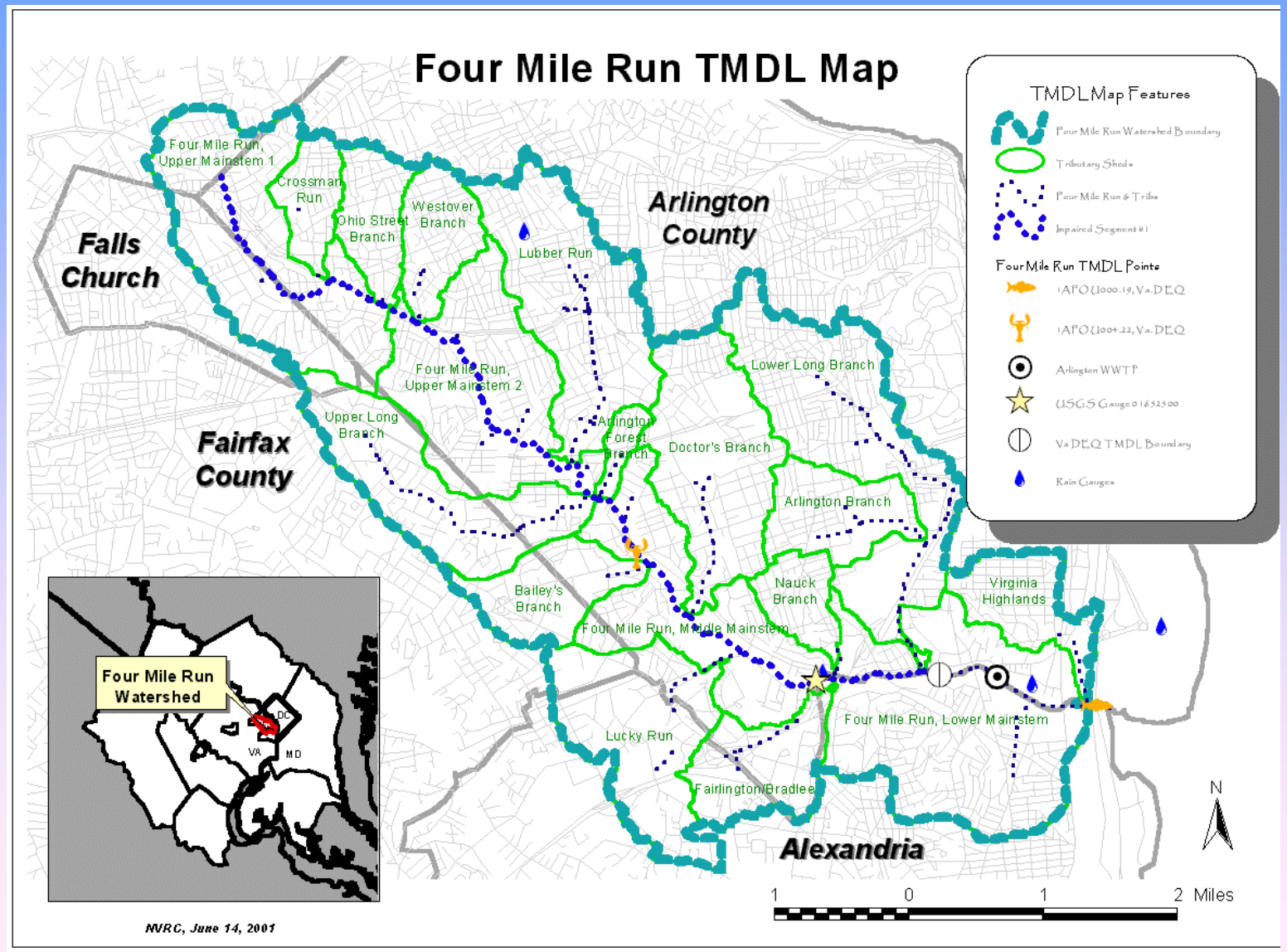
Impairments in the Four Mile Run Watershed

Water-body	Cause	Stream Name	Size	Years Listed
VAN-A12R*	Bacteria	Four Mile Run (from headwaters to upstream of Arlington Ridge Road Bridge)	7.88 mi	1996 1998 2002
VAN-A12E**	Bacteria	Four Mile Run (from upstream limit of tidal waters to confluence with Potomac River)	0.25 sqmi	1996 1998 2002
	PCBs in Fish Tissue			2002

* The Bacteria TMDL approved in 2002 addressed only the free flowing portion of Four Mile Run (VAN-A12R.)

** The TMDL for Bacteria the tidal portion (VAN-A12E) falls under the Consent Decree and must be developed by 2010. The TMDL for PCBs in Fish Tissue in the tidal portion must be developed by 2014.

Map of the Four Mile Run Watershed



Water Quality Assessment Results for Bacteria in Four Mile Run

Station : 1AFOU004.22 (Rt. 244 BRIDGE)				
Year	**Number of Exceed.**	**Number of Samples**	**Exceed. Rate**	**Max. Concen-tration**
1996	3	7	43%	8,000
1998	5	18	28%	8,000
2000	4	18	22%	5,600
2002	5	22	23%	8,000

Four Mile Run Bacteria TMDL IP Development Schedule

- First Technical Advisory Committee (TAC) Meeting (May 27, 2003)
- First Public Meeting (June 11, 2003)
- Second TAC Meeting (review existing and proposed BMPs, September 2003)
- Third TAC Meeting (review draft IP report, November 2003)
- Second Public Meeting (review final draft IP report, December 2003)

Developing an Implementation Plan for the Four Mile Run Bacteria TMDL

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City of Falls Church

- Daylighting a portion of Four Mile Run
- Application for MS4 permit
- Storm drain marking
- Stream Stewards
- Neighborhood Watershed Teams
- Watershed-friendly Garden Tour
- Spring and Fall Citywide Cleanups
- Adopt-a-Street
- Operation EarthWatch
- LEED criteria for Special Exception Ordinance

Fairfax County's Water Quality/Watershed Management Programs

- Chesapeake Bay Preservation Ordinance (since 1993)
  - Required BMPs countywide
  - Established riparian buffer preservation and restoration - Resource Protection Areas (RPAs)
- VPDES/MS4 Permitting - Phase 1 Community (since1997)
  - Stream and outfall water quality monitoring
  - Illicit discharge detection and elimination
- Stream Protection Strategy Program (since1998)
  - Integrated volunteer citizen stream monitors
  - Baseline Study published January 2001
- Watershed Management Plan Development (over 5-7 yrs)
  - Comprehensive stream physical assessment completed
  - Comprehensive community involvement and outreach envisioned

Fairfax County's Water Quality/Watershed Management Programs cont'd

- Bacteria Water Quality Monitoring
  - Over 20 yrs of fecal coliform data gathered by Health Dept.
- Wastewater Collection Line Maintenance & Inspection Programs
  - Preventative Sewer Maintenance
  - Rehabilitation of Sanitary Sewers
- Septic System Inspection, Enforcement and Management Programs
- Wildlife Management Programs (deer & geese)
- Pet Waste Ordinance (Pooper-Scooper) Program

City of Alexandria

- Water Quality Ordinances
  - Chesapeake Bay
  - Erosion and Sediment Control
  - Water Quality Management Supplement
- Four Mile Run Grant Participation
  - Small Watershed Grant
  - Restoration Grant
- Four Mile Run Initiatives
  - Work Program
  - Maintenance Program
- Storm Drain Inlet Marking Program
- Stream Restoration and Wetland Enhancement

Arlington County
Watershed Management Programs

- Watershed Management Plan adopted in 2001 to:
  - Address effects of existing development on water quality and streams
  - Respond to multiple regulatory mandates, from TMDLs to MS4 to C2K
- New programs include: expanded street sweeping/catch basin cleaning; storm sewer inspections; increased construction inspection; stream restoration/BMP retrofitting; volunteer monitoring; education
- Stormwater utility study to be conducted in 2003
- Comprehensive revision of ChesBay Ordinance in 2003

Arlington County
Watershed Management Programs (cont.)

- Programs targeting potential or actual bacteria sources include:
  - Dry weather inspections under MS4 and optical brightener monitoring with NVRC
  - Sanitary sewer rehab. program: 35 miles of 474 mile system relined since 1991; new Sanitary Sewer Master Plan recommends increase in rehab. rate from 1% to 1.5% per year.
  - Education campaign in Arlington cinemas that includes pet waste cleanup message

For more info., visit:

www.co.arlington.va.us/des/epo/epo_main.htm

Implementation Plan
for
Bacteria TMDL for Four Mile Run

Public Meeting - June 11th, 2003
Fairlington Community Center, Arlington, Virginia

Bill Hicks, P.E.
Northern Virginia Regional Commission

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Presentation

- Larger Context of Four Mile Run
- Specifics of Four Mile Run TMDL
- Project: Implementation Plan
- Questions & Discussion

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Active Four Mile Run Projects

- Eco-Teams (ACE)
- Flood Control Project (1974)
  - Work Program (NVRC) & Maintenance (Arlington / Alexandria)
- Restoration Project
  - Arlington / Alexandria / US EPA Grant
  - US ACE Involvement
- State Storm Sewer Regulations - VPDES MS4 Permits
- Stream Stewards (ACE)
- Stream Restoration
- Stream Cleanups
- Tree Planting
- WWTP Capital Improvements

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The TMDL Package

¿ TMDL ?

- **“Total Maximum Daily Load”**
- **TMDLs are tied to a specific Water Quality Standard**
- **<u>Water Pollution Budget</u>**
  - *for a Specific Pollutant*
  - *in a Specific Waterbody*

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Point

&

Nonpoint

Source Pollution

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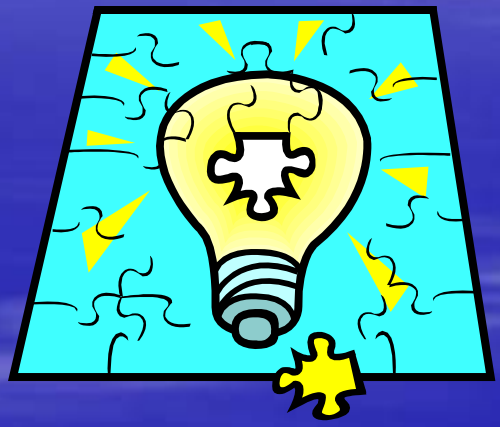
Four Mile Run Issues

- Quantity of Water
- Sediment Transport
- Litter / Floatables
- Excess Nutrients
- Public Access & Perception
- Water Quality Standards



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Diagnosis Please!

¡Urbanization!

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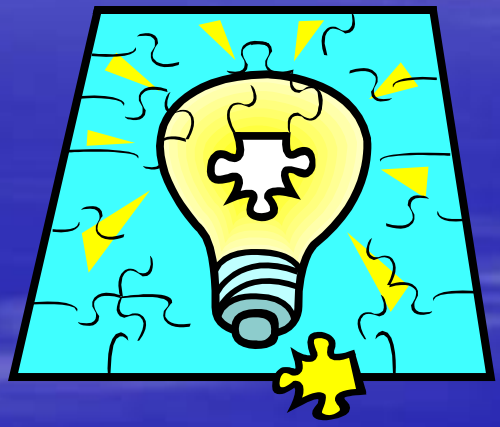
Of the Four Mile Run Issues…

- ~~Quantity of Water~~
- ~~Sediment Transport~~
- ~~Litter / Floatables~~
- ~~Excess Nutrients~~
- ~~Public Perception~~
- Water Quality Standards
  - Bacteria



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Water Quality Criteria of Concern

- Old Fecal Coliform Standard
  - Instantaneous Maximum — 1000 MPN/100mL
  - Geometric Mean — 200 MPN/100mL
    2 plus samples / 30 Days
- Interim Fecal Coliform Standard
  - Instantaneous Maximum — 400 cfu/100mL
  - Geometric Mean — 200 cfu/100mL
- New E. coli Standard
  - Instantaneous Maximum — 235 cfu/100mL
  - Geometric Mean — 126 cfu/100mL

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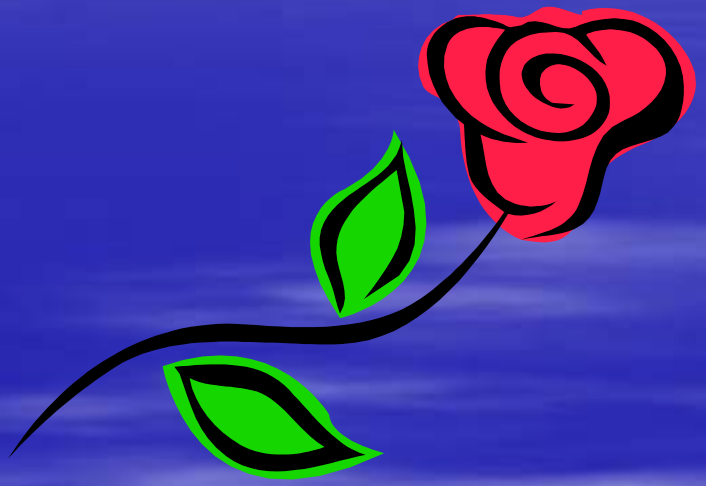
A rose by any other name would smell as sweet. Well…

- Fecal Coliform
  - Indicator
  - Old Standard
  - Interim Standard
  - Approved TMDL
- E. Coli
  - New Standard
  - Reevaluation
- It's a Bacteria Standard



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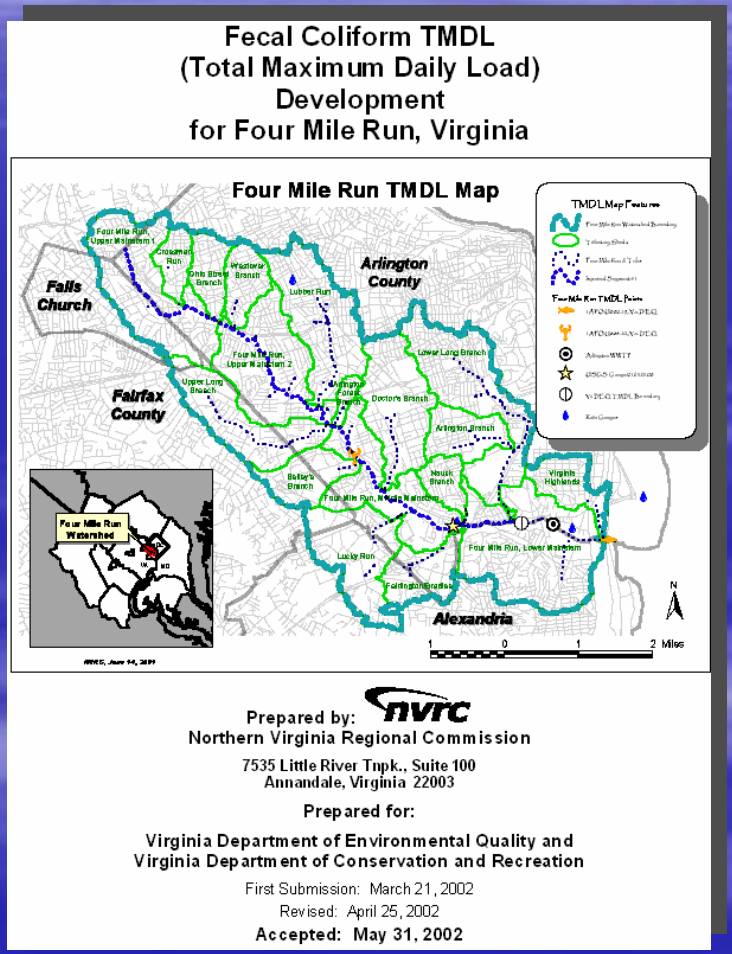
Four Mile Run & its TMDL

- 1996 VA DEQ - 303d List
- Impairment: Fecal Coliform
- 1998 VA DEQ - 303d List
  - And since…
- 1999 Consent Decree
- TMDL Developed (2001 – 2002)
- Approved by EPA May 31, 2002
- **Implementation Plan…**



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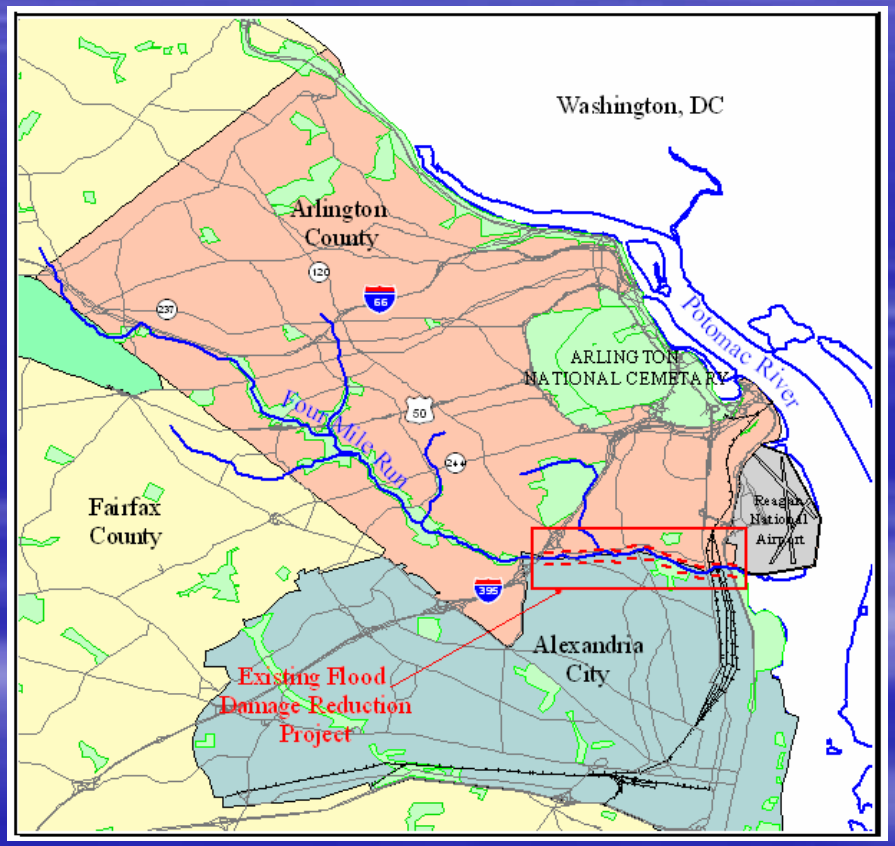
Bio: Four Mile Run

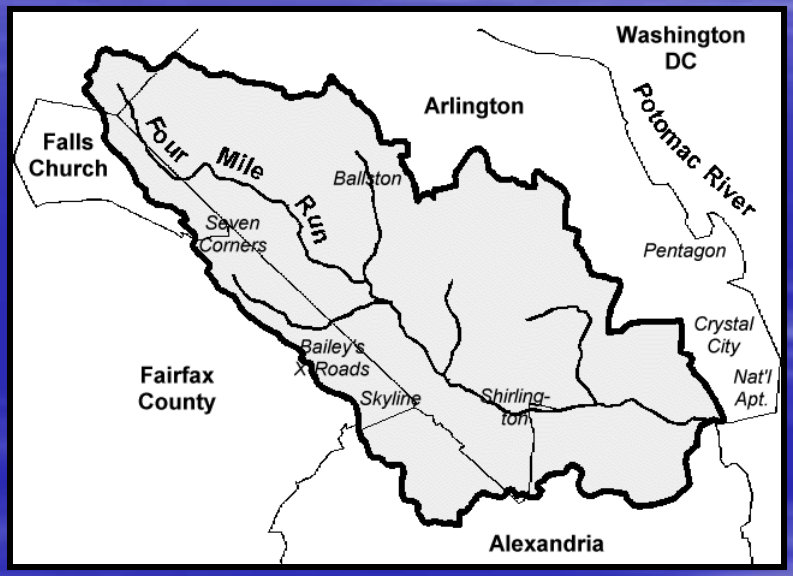
- Approximately 9 miles long
- Discharges to Potomac River
- Last 2.3 miles is contained in a Flood Control Channel
- Last 1.5 miles are tidal



Courtesy of USACE

Bio: Four Mile Run Watershed

- 19.7 Square Miles
- Portions of
  - Arlington County
  - Fairfax County
  - City of Alexandria
  - City of Falls Church
- 100% Urbanized



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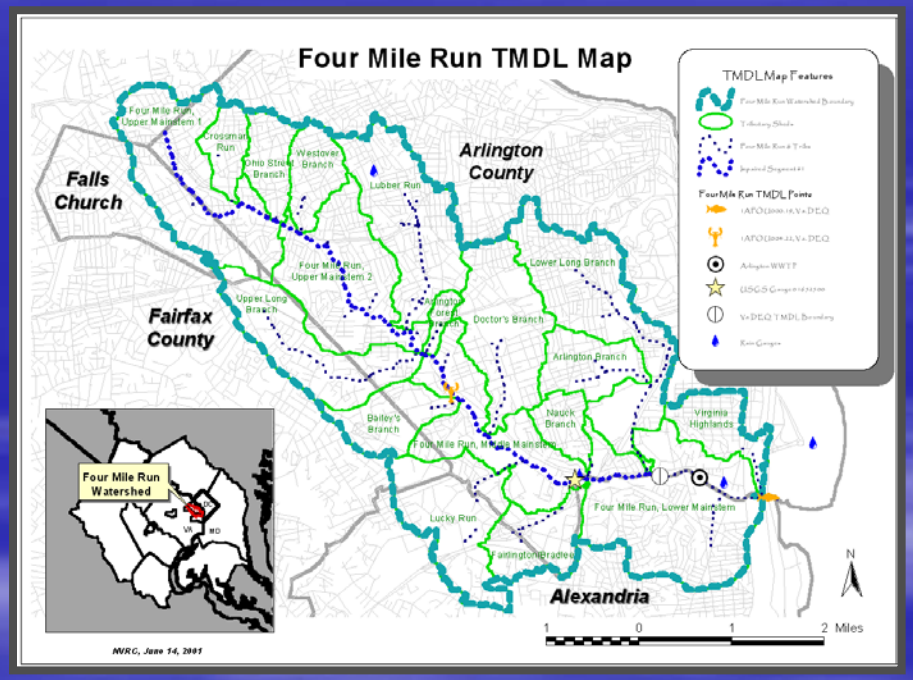
Four Mile Run TMDL

- TMDL
  - Nontidal portion
  - Length 7.5 miles
  - Watershed 17.0 square miles
- Only 1 permitted point source (pH limit)
- Note: The Arlington County Water Pollution Control Plant lies outside the limits of TMDL



TMDL

Total Maximum Daily Load =

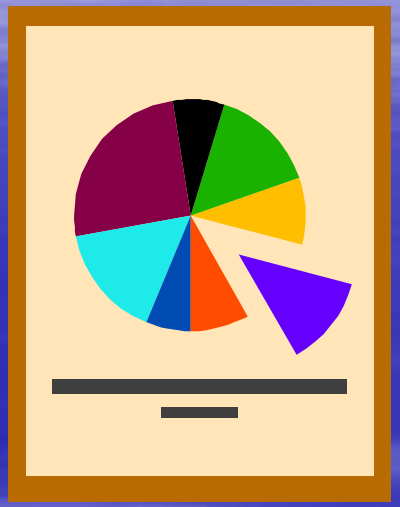
+ Waste Load Allocations [Point Source]

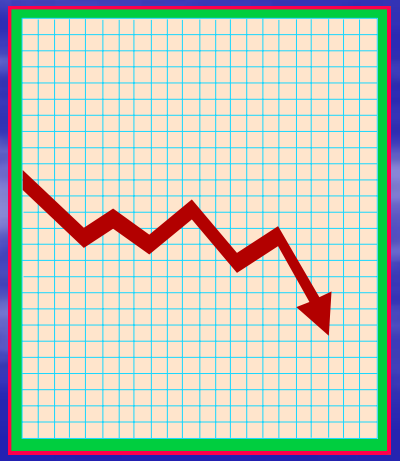
+ Load Allocations [Nonpoint Source]

+ Margin of Safety [5 Percent]

Data Acquisition

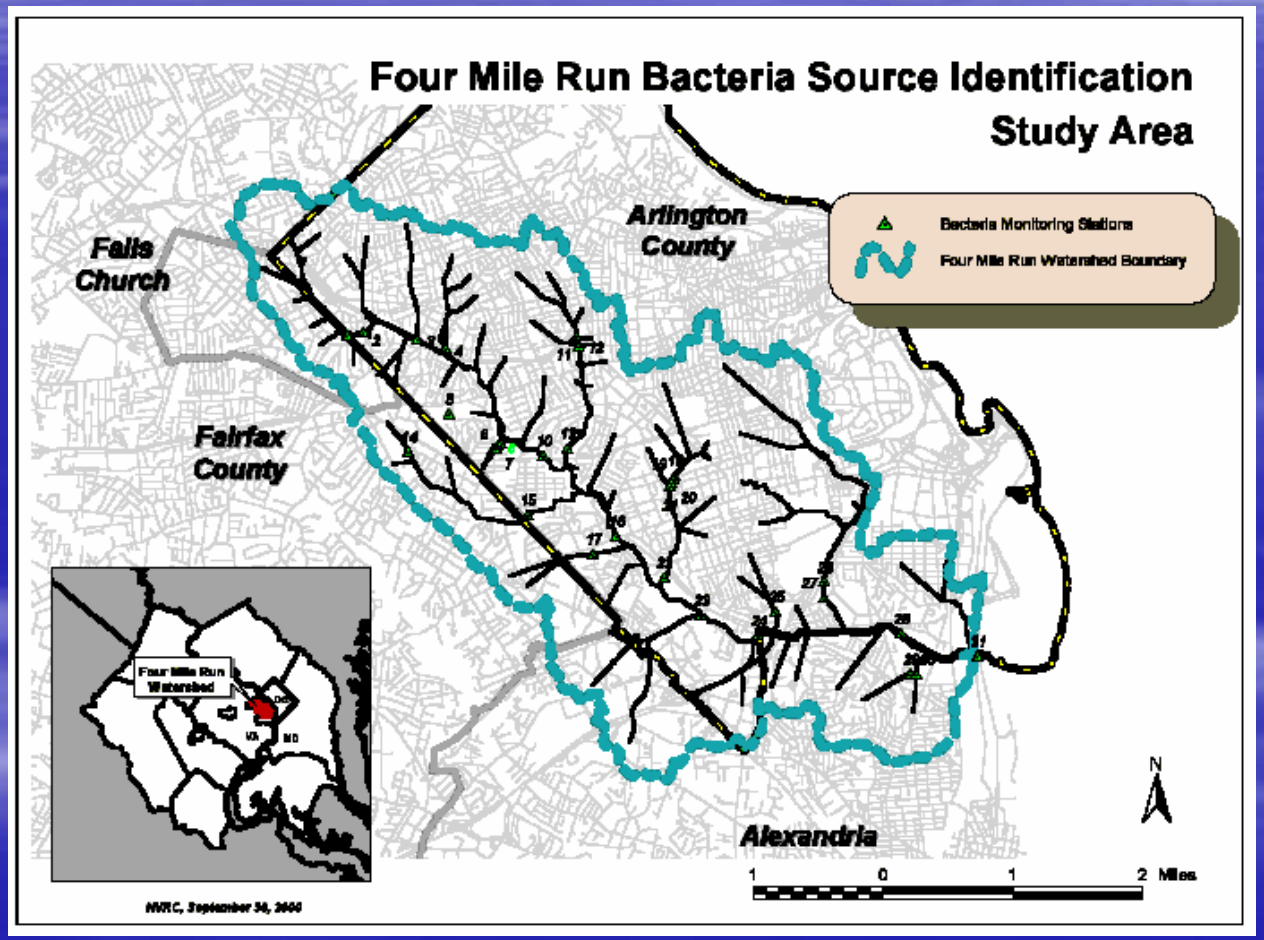
- Who were the contributors?
- Where are they?
- How much do they contribute?
- Etc.





DNA Source Tracking Study

1998



Analyzed by Pulsed Field Gel Electrophoresis (PFGE) method.

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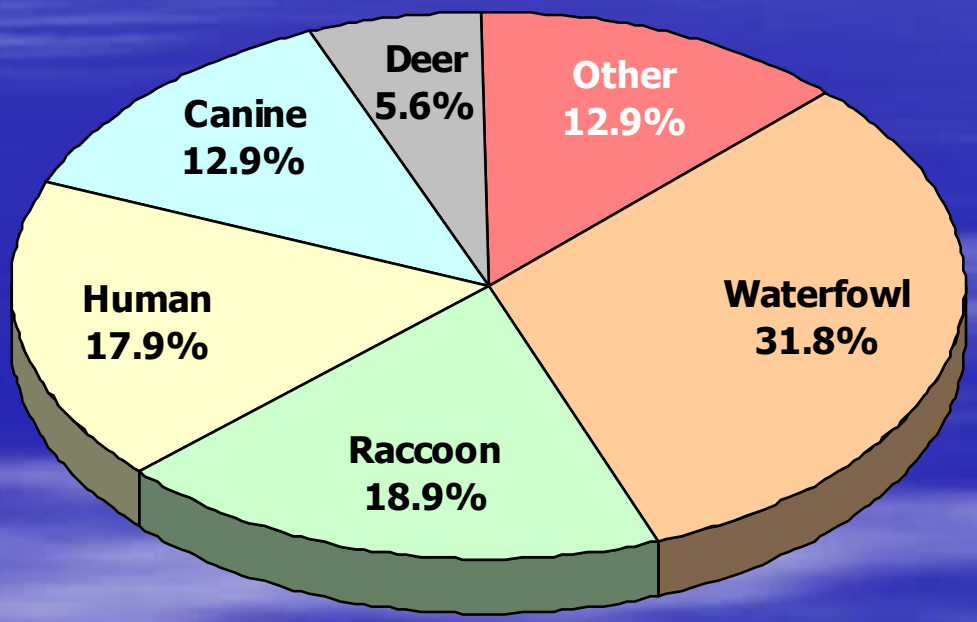
Fecal Coliform Sources in Four Mile Run



Four Mile Run BST Results, 1999-2001 (N=292)

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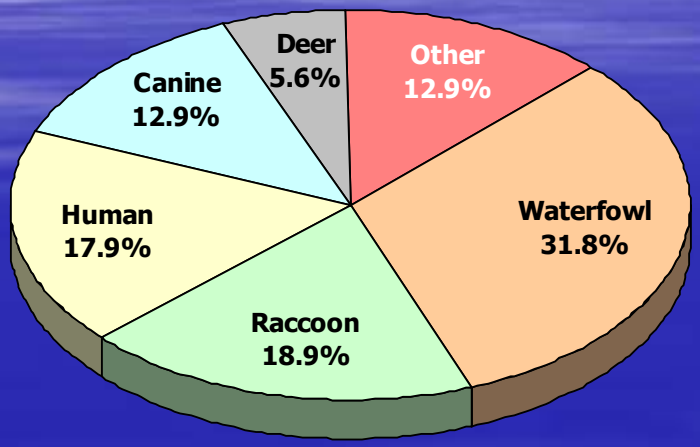
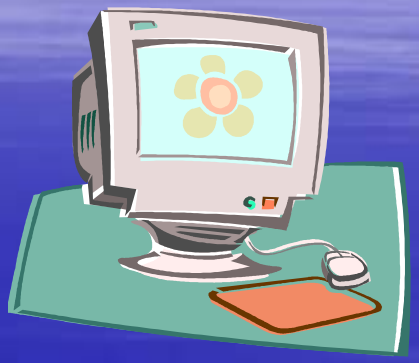
Fecal Coliform Sources





Annual Fecal Coliform Loadings (counts/year) Used for Developing the Fecal Coliform TMDL for Four Mile Run

Parameter	WLA	LA	MOS*	TMDL
Fecal coliform	2.04E+13	9.61E+14	4.91E+13	1.03E+15
* Five percent of the TMDL				

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Bacteria TMDL for Four Mile Run

Annual Fecal Coliform Loadings (counts/year) Used for Developing the Fecal Coliform TMDL for Four Mile Run				
Parameter	**WLA**	**LA**	**MOS***	**TMDL**
Fecal coliform	2.04E+13	9.61E+14	4.91E+13	1.03E+15
* Five percent of the TMDL				

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Using Geometric Mean Criteria

(200 MPN/100mL – 5%)

	Reduction in Loadings from Existing Conditions (%)					% days Geometric Mean
	Waterfowl	Raccoon	Human	Dog	Other Wildlife	> than 190 MPN/100mL
Existing Conditions	0	0	0	0	0	65
Scenario 1	0	0	95	95	0	54
Scenario 2	50	50	95	95	0	41
Scenario 3	80	80	98	98	80	8
Scenario 4	**95**	**95**	**98**	**98**	**95**	**0**

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From a TMDL to an Implementation Plan

Translate the Water Pollution Budget into "Actionable Items"

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¿ Task at Hand ?

- ***Develop an Implementation Plan for the Fecal Coliform TMDL approved for Four Mile Run.***

- It is not to change the designated use of Four Mile Run through a Usability Attainment Analysis (UAA).

- And Really only for Phase 1…

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A Phased Approach

- Stated explicitly in the US EPA Decision Rationale
  - Phase 1 – Anthropogenic Sources (Human Sources)
  - Phase 2 – Background or Natural Loading / Designated Use Consideration {Use Attainability Analysis}
  - Phase 3 – Monitoring (concurrent with phases 1 &2)

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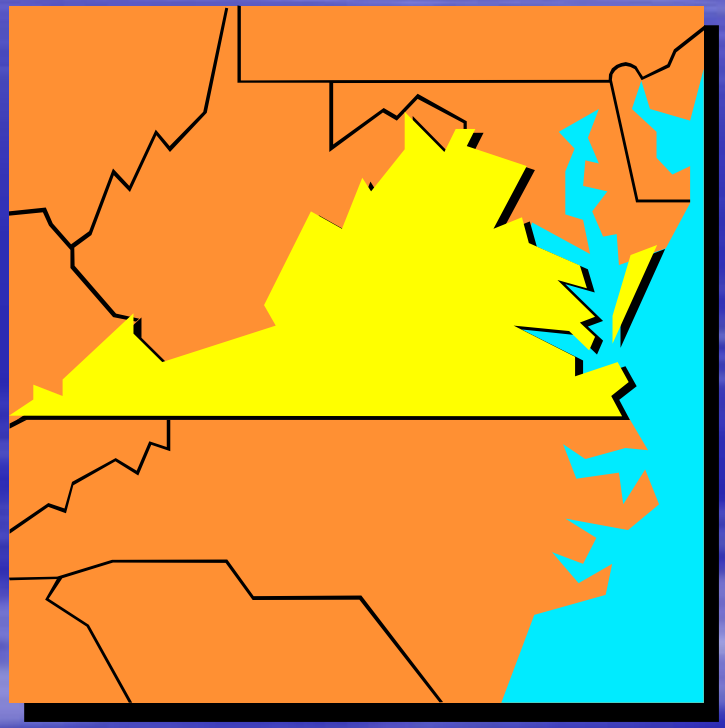
Commonwealth of Virginia

- Designated Use – "Primary Contact / Recreational Use"
- Regardless of
  - Size
  - Depth
  - Location
  - Actual Use



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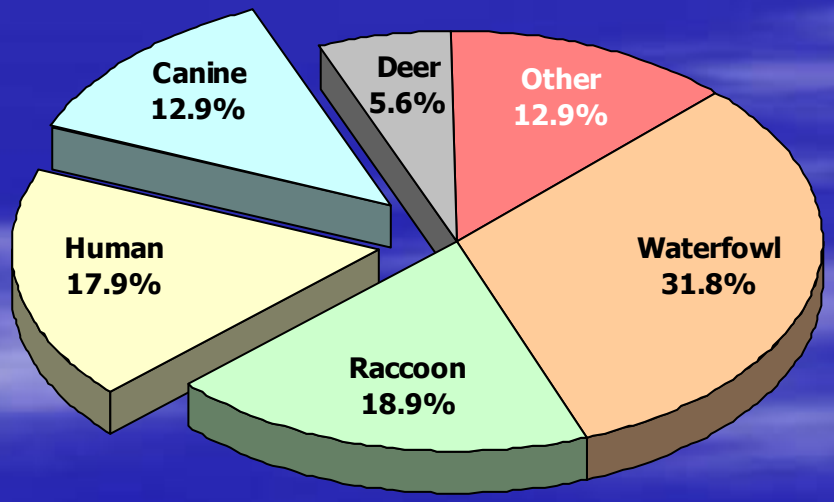
A Phased Approach

- Stated explicitly in the Decision Rationale
- Phase 1 – Anthropogenic Sources or “Human Sources”



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Geometric Mean
(200 MPN/100mL – 5%)

	Reduction in Loadings from Existing Conditions (%)					% days Geometric Mean
	Waterfowl	Raccoon	Human	Dog	Other Wildlife	> than 190 MPN/100mL
Existing Conditions	0	0	0	0	0	65
Scenario 1	0	0	95	95	0	54
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Scenario 3	80	80	98	98	80	8
Scenario 4	**95**	**95**	**98**	**98**	**95**	**0**

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Phase 1 – Implementation Plan

- Target Anthropogenic Sources
- Reassess in fifth year
- VA DEQ
  - 6-year monitoring cycle
- Four Mile Run –
  - Trend Station at West Glebe Road (Bi-Monthly)
  - 2-year rotational monitoring
    (July 1, 2005 thru June 31, 2007 – Adds 2 stations)
  - Will include E. coli

What to do?

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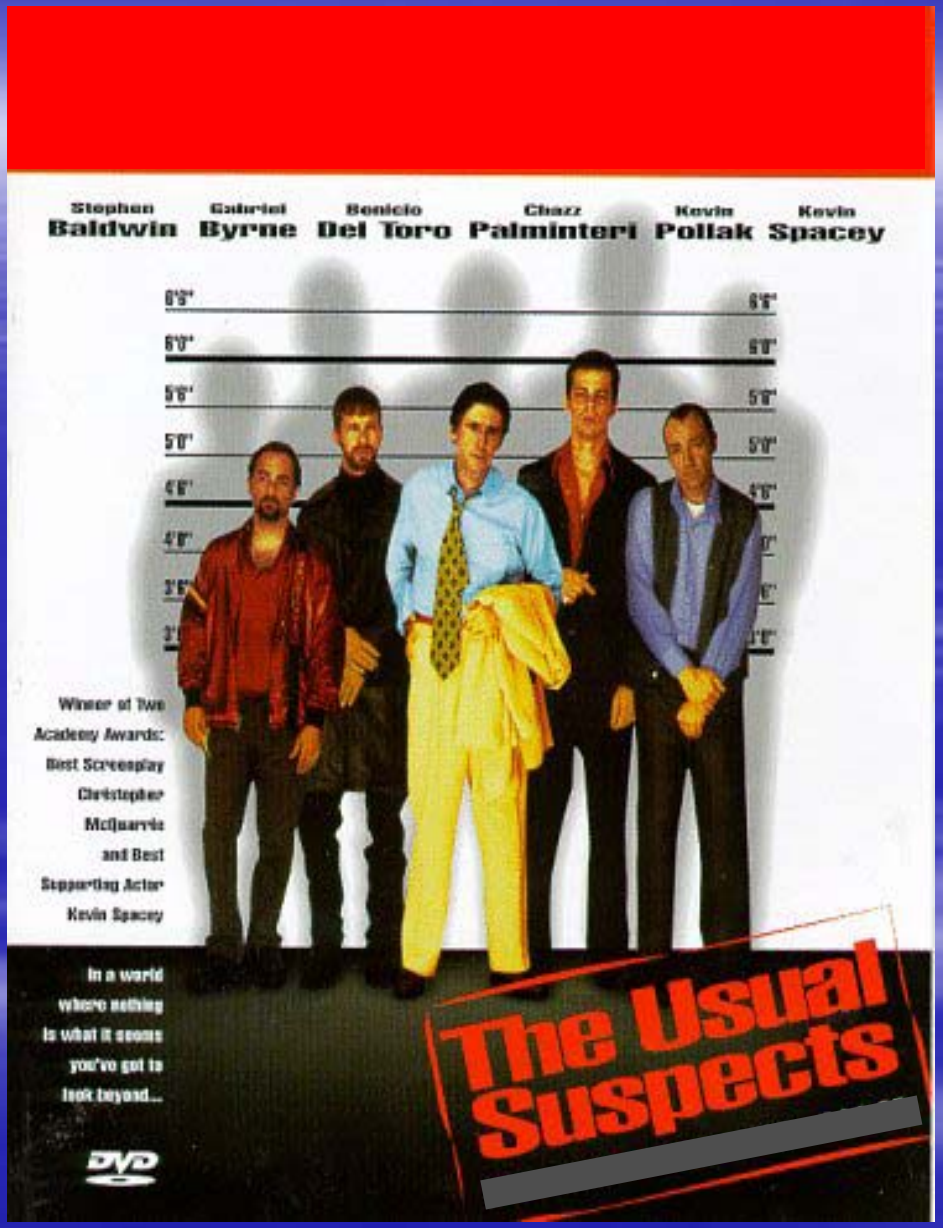
Bacteria Sources

- Faulty Sanitary Sewers (illicit con., SSOs, exfiltration)
- Agricultural Practices
- Failing Septic Systems
- Combined Sewer Outfalls
- Domestic Pets
- Wildlife (including birds)



Slide Adapted from Brian Rustia, MW COG Slide

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Some Possible Solutions – "Best Management Practices"

- **Structural**
  - Treatment Facilities,
    e.g. Regional Stormwater Management Ponds, Sand filters, etc.
  - Sanitary Sewer programs
    e.g. I&I, Illicit Discharge Detection & Elimination, etc.
  - Street Sweeping
  - Dog Parks
  - Stream Restoration / Daylighting Culverts
  - Riparian Buffer Habitat

- **Non-structural**
  - Policy Changes,
    e.g. pooper scooper laws, land use & land management policies
  - Education & Outreach,
    e.g. pooper scooper campaigns

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Technical Advisory Committee

- City of Alexandria
- Arlington County
- City of Falls Church
- Fairfax County
- Metropolitan Washington Council of Governments
- Falls Church Village Society
- Arlingtonians for a Clean Environment
- Virginia Department of Environmental Quality
- Virginia Department of Conservation and Recreation
- Northern Virginia Regional Commission

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What's the Timeline?

- ✓ May 27, 2003 — 1st Technical Advisory Committee (TAC) meeting
- ✓ June 11, 2003 — 1st Public meeting
- September, 2003 — 2nd TAC meeting
- November, 2003 — 3rd TAC meeting to present a draft document
- December, 2003 — 2nd Public meeting to present revised draft
- January 2003 - ? — Approvals, VA DEQ, County Boards, City Councils, US EPA Review

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Your Thoughts…

- In Which areas of the implementation plan should we focus?

- What “Best Management Practices” would you like to see addressed in the Implementation Plan?

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Questions & Discussion

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Department of Conservation & Recreation

CONSERVING VIRGINIA'S NATURAL AND RECREATIONAL RESOURCES

Memorandum of Agreement between DCR and DEQ on TMDL Development

- DEQ has overall lead for all TMDL activities
- DCR has agreed to assist in development of nonpoint source (NPS) TMDLs
- DEQ retains responsibility for public participation and EPA approval process

Implementation Plan Development

- DEQ is required by state legislation to develop implementation plan
- DCR through MOU has lead for NPS TMDL implementation plans
- DEQ, DCR, VA Dept. of Health and other state, federal and local agencies will coordinate on plan development

Implementation Plan Development

- Implementation plan development needs to be local based and supported
- DCR staff will assist and be part of the process
- All stakeholders within the watershed should have the opportunity to participate in plan development/implementation

Integration with other Watershed Plans

- Multiple water quality programs and activities
- Each has specific geographical boundaries and goals
- TMDL implementation will be coordinated with other plans
- Chesapeake Bay 2000 Agreement
- Tributary Strategies
- Local Comprehensive Plans
- Etc.

Funding

- No specific funding source for TMDLs once IP is developed
- Localities/others can apply for state/federal grant funds
- TMDL implementation often grant priority, for example USEPA 319
- Potential funding sources in VA Guidance Manual for TMDL IP (June 03)

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